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425 425
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FIG. 3.

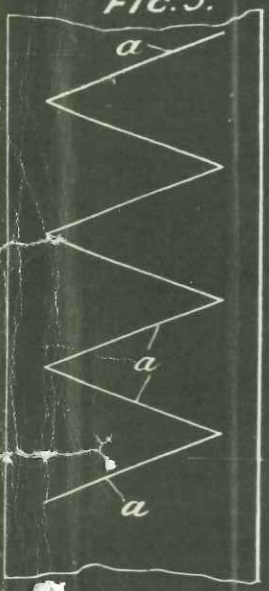


FIG. 4.

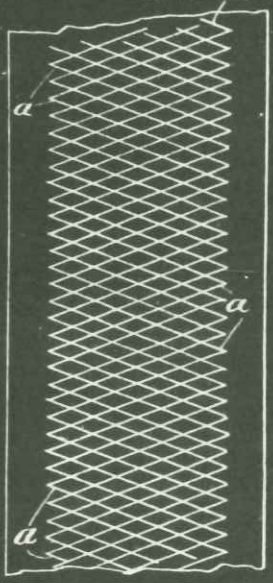


FIG. 5.

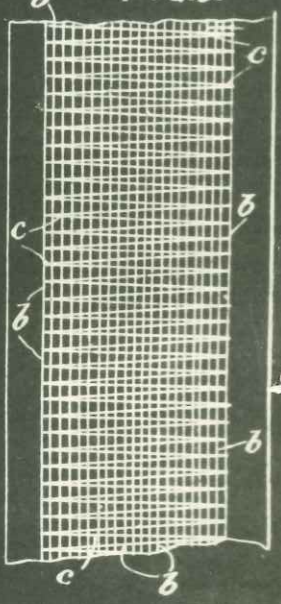


FIG. 6.

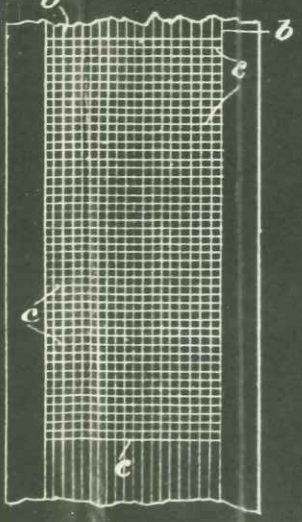


FIG. 7.

FIG. 8.

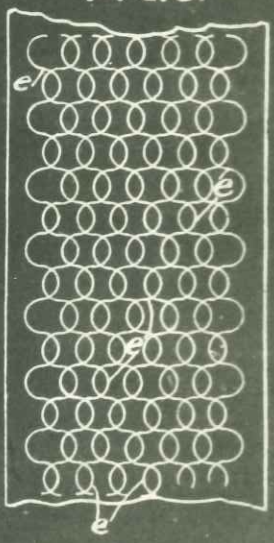


FIG. 1.

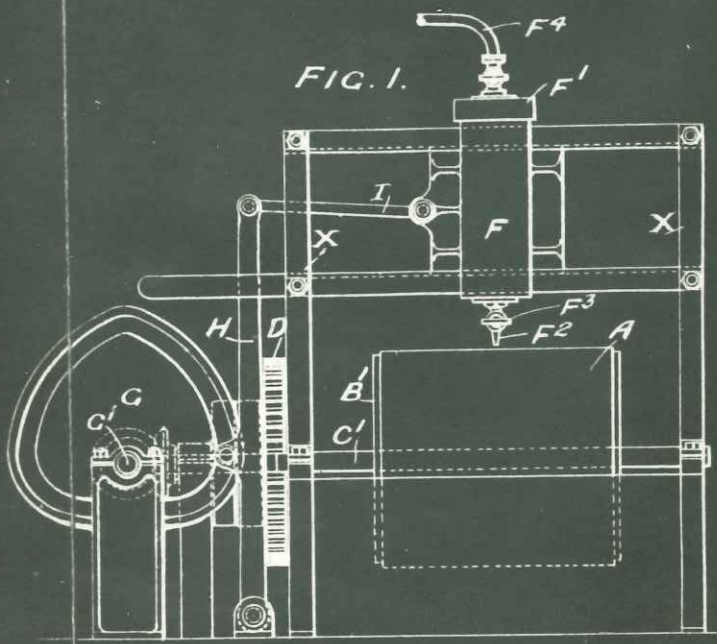
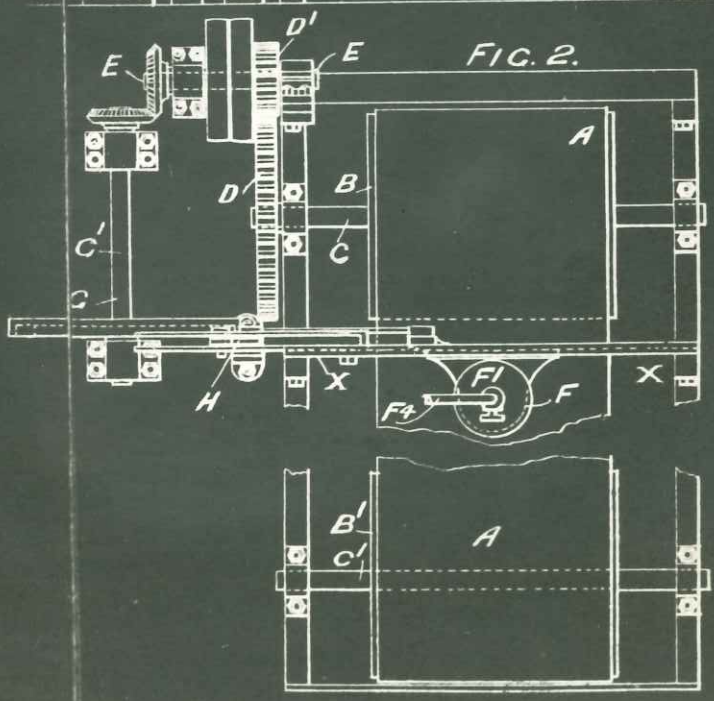


FIG. 2.



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N° 17,549 A.D. 1898

Date of Application, 15th Aug., 1898
Complete Specification Left, 15th May, 1899—Accepted, 15th Sept., 1899

PROVISIONAL SPECIFICATION.

Improvements in Producing Fabrics or Tissues from Liquid or Plastic Materials.

I, ADAM MILLAR, residing at Yew Bank, Helensburgh, Dumbartonshire, Manufacturer, do hereby declare the nature of this invention to be as follows:—

This invention consists in producing fabrics or tissues from threads or filaments formed of materials while in a liquid or plastic condition, and which threads are so placed as to be in contact with each other at short distances apart, and made to adhere to each other at the points of contact.

In carrying out this invention, the following are examples of methods which are applicable.

A travelling endless web of a flexible material, having a smooth and non-adhesive surface, such as the fabric known as oil-cloth or wax-cloth is employed.

The web is of considerable length, say twelve yards or longer, and of suitable breadth, say one yard, and is carried by drums or rollers which rotate on their axes.

The liquid or plastic material from which the fabric is formed is contained in a reservoir or cistern situated over the web and furnished with an air-tight cover, the reservoir having a nozzle regulated by a small stop-cock.

The liquid material exudes from the nozzle in a fine thread-like stream and falls upon the surface of the web. The flow of the material through the nozzle is obtained by the pressure of compressed air or like means.

The cistern is carried by a frame in which it has a to-and-fro motion across the web, and the web has a continuous forward movement, these movements being produced by suitable gearing.

The machine, when put in motion, forms a thread of the material contained in the cistern, which thread is laid upon the travelling web in the form of a zig-zag line, and covering the whole length of the web.

The length of the web is so adjusted that, when the web has made one complete passage, the thread laid down on the second passage of the web shall be a little in advance or a little behind the thread previously laid down, so that the continued working of the machine produces a tissue or fabric of a pattern composed of overlapping zig-zag lines.

In order to ensure the adhesion of the threads to each other at their points of contact, the tissue may be passed under a pressing roller, or a jet of air may be blown upon the tissue, and the air may be charged with vapour or with a liquid in the form of a fine spray, so as to cement the threads together.

The fabric may be removed from the web, when the threads have become sufficiently tenacious, and completed by such subsequent treatment as may be required.

The materials which may be used in producing fabrics or tissues by the process described, include such substances as gutta-percha, india-rubber, the product known to chemists as "nitro-cellulose," the animal products known as "gelatine" and "albumen," and generally any substance which can be made plastic or liquid and which may subsequently be made non-plastic and tenacious, either

[*Price* 8*d*.]

8*d*.

by the evaporation of the solvent employed to produce the liquid or plastic condition, or by chemical treatment, or by other suitable methods.

The substances named are made liquid or plastic by suitable solvents, all which solvents are well known to chemists and are in common use in various industries.

In cases where heat is needed to produce the necessary fluidity, the reservoir or cistern may have a hot water jacket or casing, the heat being maintained by a gas burner attached to the frame which carries the cylinder, or by other convenient arrangement.

There are obviously a great variety of modifications of the method described, as, for example, in regulating the speed of the forward movement of the web so that, while the web makes a complete travel of its whole length, the cross motion of the cistern shall be about one twentieth part of an inch. In this way the thread produced is laid down in parallel lines upon the travelling web and has the appearance of the warp yarns in the looms of ordinary construction.

To make the weft yarns, the speeds of the two parts are reversed; the cistern travels across the whole width of the web during the time in which the slow movement of the web advances only one twentieth of an inch. In this way the tissue will be formed of parallel warp threads crossed by slightly diagonal threads of weft; but if the web stands still while the cistern travels across it, and the small forward movement takes place before the return movement of the cistern begins, the tissue will appear as an open calico or plain cloth.

Another modification consists in mounting the cistern upon an axis and causing it to rotate continuously and placing the nozzle so that the thread is laid down in circular lines. By this method a tissue is obtained of a pattern composed of intersecting or interlacing circular lines.

In the processes just described, there has been only one cistern and one nozzle, but it is obvious that several cisterns may be employed at one time, and that each cistern may have several nozzles, in which case a very rapid production of the fabric may be obtained, besides a great variety in the pattern of the fabric.

For example a pattern composed of intersecting sinuous lines or ovals may be produced by two cisterns, each furnished with a number of nozzles, placed at equal distances across the whole width of the tissue to be formed. The to-and-fro movement of the two cisterns may be limited to a short distance so that the thread is laid down in sinuous or serpentine lines parallel to each other. The nozzles of the one cistern are however so placed that the sinuosities of the one set cut into the sinuous lines of the other and produce a pattern of intersecting ovals.

This method of using more than one cistern or reservoir of liquid substance allows tissues to be made with stripes and checks of different colours by using differently coloured materials in the several cisterns, and the materials contained in each cistern may also be different.

A further application of this method of producing tissues consists in covering the travelling web with a light open fabric of cotton or other material woven by the ordinary methods, and to which the threads of liquid material will adhere, the calico becoming a permanent foundation for the tissue, and being removed from the web when the tissue formed by the nozzles has been completed.

Fabrics may be produced, by the processes described, so as to be of considerable thickness, and employed as a lining for giving extra warmth to quilts and other articles; the thickness being regulated by the number of times which the travelling web passes under the thread-producing nozzles.

Dated this 13th day of August 1898.

WALLACE FAIRWEATHER,
Of the Firm of Cruikshank & Fairweather,
Chartered Patent Agents,
62, Saint Vincent Street, Glasgow, Agent for the Applicant.

COMPLETE SPECIFICATION.

Improvements in Producing Fabrics or Tissues from Liquid or Plastic Materials.

I, MARGARET NISBET CROSS, or MILLAR, residing at Yew Bank, Helensburgh, Dumbartonshire, Executrix of the late ADAM MILLAR, of Yew Bank, Helensburgh, Dumbartonshire, Manufacturer, conform to Decree Dative by the Sheriff of Stirling, Dumbarton and Clackmannan, dated at Dumbarton the Second day of May, Eighteen hundred and ninety-nine, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention consists in producing fabrics or tissues from threads or filaments formed of materials while in a liquid or plastic condition, and which threads are so placed as to be in contact with each other at short distances apart, and made to adhere to each other at the points of contact.

The invention is illustrated by the accompanying drawings, Figure 1 being a front elevation, and Figure 2 a plan of a convenient form of machine which might be employed to produce the fabrics or tissues forming my invention. Figures 3 to 8 inclusive show six different methods of producing fabrics.

A travelling endless web A of a flexible material, having a smooth and non-adhesive surface, such as the fabric known as oil-cloth or wax-cloth is employed.

The web A is of considerable length, say twelve yards or longer, and of suitable breadth, say one yard, and is carried by drums or rollers B, B^1, which rotate on their axes C, C^1, one of the drums being driven by means of spur gearing D, D^1, from the pulley shaft E.

The liquid or plastic material from which the fabric is formed is contained in a reservoir or cistern F situated over the web A and furnished with an air-tight cover F^1, the reservoir having a nozzle F^2 regulated by a small stop-cock F^3.

The liquid material exudes from the nozzle F^2 in a fine thread-like stream and falls upon the surface of the web A. The flow of the material through the nozzle is obtained by the pressure of compressed air or like means, contained in a reservoir and communicating by a flexible tube F^4 with the cistern F.

The cistern F is carried by a frame X in which it has a to-and-fro motion across the web A and the web has a continuous forward movement, these movements being produced by suitable gearing, the former motion by means of the cam G on the shaft G^1 the lever H actuated by said cam G and the link I, and the latter motion by means of the gearing D, D^1, before referred to.

The machine, when put in motion, forms a thread of the material contained in the cistern F, which thread is laid upon the travelling web A in the form of a zig-zag line *a*, as shown at Fig. 3, and covering the whole length of the web.

The length of the web A is so adjusted that, when the web has made one complete passage, the thread laid down on the second passage of the web A shall be a little in advance or a little behind the thread previously laid down, so that the continued working of the machine produces a tissue or fabric of a pattern such as is illustrated by Figure 4, composed of overlapping zig-zag lines *a*.

In order to ensure the adhesion of the threads to each other at their points of contact, the tissue may be passed under a pressing roller, or a jet of air may be blown upon the tissue, and the air may be charged with vapour or with a liquid in the form of a fine spray, so as to cement the threads together.

The fabric may be removed from the web A when the threads have become sufficiently tenacious, and completed by such subsequent treatment as may be required, such treatment being varied to suit the various materials employed.

Improvements in Producing Fabrics or Tissues from Liquid or Plastic Materials.

The materials which may be used in producing fabrics or tissues by the process described, include such substances as gutta-percha, india-rubber, the product known to chemists as "nitro-cellulose," the animal products known as "gelatine" and "albumen," the gelatine found in the body of the silk worm, a solution of silk in hydro-chloric acid, or other suitable solvent, and generally any substance which can be made plastic or liquid and which may subsequently be made non-plastic and tenacious, either by the evaporation of the solvent employed to produce the liquid or plastic condition, or by chemical treatment, or by other suitable methods.

The substances named are made liquid or plastic by suitable solvents, all which solvents are well known to chemists and are in common use in various industries.

In cases where heat is needed to produce the necessary fluidity, the reservoir or cistern may have a hot water jacket or casing, the heat being maintained by a gas burner attached to the frame which carries the cylinder, or by other convenient arrangement.

The subsequent processes referred to above may be varied to suit the several materials employed, as for example when india rubber is used, the fabric may be treated by the process known as "vulcanizing" when nitro-cellulose is used, a process to render the fabric less combustible, and when gelatine or albumen is used, the fabric may be exposed to the vapour of the chemical product known as "formic-aldehyde," also called "formaline," and so rendered insoluble in water, or any other known method of rendering gelatine insoluble may be employed.

The fabric may also be dyed and printed as one of the subsequent processes, and a crape-like fabric may be produced by means of suitable rollers, much in the same way as is in ordinary use with other fabrics.

There are obviously a great variety of modifications of the method described, as, for example, in regulating the speed of the forward movement of the web A so that, while the web makes a complete travel of its whole length, the cross motion of the cistern F shall be about one twentieth part of an inch. In this way the thread produced is laid down in parallel lines *b* as represented by the vertical lines, Fig. 5, upon the travelling web A and has the appearance of the warp yarns in the looms of ordinary construction.

To make the weft yarns, the speeds of the two parts are reversed; the cistern F travels across the whole width of the web A during the time in which the slow movement of the web advances only one twentieth of an inch. In this way the tissue will be formed of parallel warp threads *b* crossed by slightly diagonal weft threads *c*; but if the web A stands still while the cistern F travels across it, and the small forward movement takes place before the return movement of the cistern F begins, the tissue will appear as an open calico or plain cloth, as shown at Fig. 6.

Another modification consists in mounting the cistern upon an axis and imparting motion to it in a circular or other path and placing the nozzle so that the thread is laid down in circular or other curved lines. By this method a tissue is obtained of a pattern such as shown at Fig. 7, composed of intersecting or interlacing circular lines *d*.

In the processes just described, there has been only one cistern and one nozzle, but it is obvious that several cisterns may be employed at one time, and that each cistern may have several nozzles, in which case a very rapid production of the fabric may be obtained, besides a great variety in the pattern of the fabric.

For example a pattern composed of intersecting sinuous lines *e*, such as shown at Fig. 8, may be produced by two cisterns, each furnished with a number of nozzles, placed at equal distances across the whole width of the tissue to be formed. The to-and-fro movement of the two cisterns may be limited to a short distance so that the thread is laid down in sinuous or serpentine lines parallel to each other. The nozzles of the one cistern are however so placed that the

sinuosities of the one set cut into the sinuous lines of the other and produce a pattern of intersecting ovals.

This method of using more than one cistern or reservoir of liquid substance allows tissues to be made with stripes and checks of different colours by using differently coloured materials in the several cisterns, and the materials contained in each cistern may also be different.

A further application of this method of producing tissues consists in covering the travelling web A, with a light open fabric of cotton or other material woven by the ordinary methods, and to which the threads of liquid material will adhere, the calico becoming a permanent foundation for the tissue, and being removed from the web A when the tissue formed by the nozzles has been completed.

Fabrics may be produced, by the processes described, so as to be of considerable thickness, and employed as a lining for giving extra warmth to quilts and other articles; the thickness being regulated by the number of times which the travelling web passes under the thread-producing nozzles.

It is not necessary that the reservoir containing the liquid material should have a to-and-fro motion imparted to it, as transverse or lateral movement may be given to the travelling band instead to obtain the same result, or the nipples only may have motion imparted to them in which case they are connected to the reservoir by means of a flexible pipe of india-rubber, or by metal pipes suitably jointed.

When narrow fabrics are required, a number of such may be produced simultaneously by one travelling web and one pair of drums by simple methods of arranging the position of the nipples so that each nipple or group of nipples has only a limited distance for the to-and-fro motion, and these nozzles or group of nozzles are so placed as to produce several separate bands or ribbons on the breadth of the travelling web.

In some cases when such a foundation fabric is used it will not be necessary to form weft threads in addition to the warp threads, as the adhesion of the warp to the foundation fabric will be sufficient to keep threads in their proper position, in such a fabric the warp threads not being crossed by the weft threads will show a highly lustrous surface, and at the same time the fabric will be strong and pliable.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

The production of fabrics or tissues from threads or filaments formed of materials while in a liquid or plastic condition, and which threads are so placed as to be in contact with each other at short distances apart and made to adhere to each other at the points of contact, substantially as described.

Dated this 13th day of May 1899.

WALLACE FAIRWEATHER,
Of the Firm of Cruikshank & Fairweather,
Chartered Patent Agents,
62, Saint Vincent Street, Glasgow, Agent for the Applicant.

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